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ITC 1.11:6-5-3

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SUMMARY OF TRADE AND TARIFF INFORMATION

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Prepared in terms of the Tariff Schedules of the United States

ELECTRICAL CAPACITORS AND RESISTORS

TSUS Items 685.80-.81 and 686.10-.11

USITC PUBLICATION
CONTROL NO. 6-5-3
MAY 1981

United States International Trade Commission / Washington, D.C. 20436

UNITED STATES INTERNATIONAL TRADE COMMISSION

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Bill Alberger, Chairman

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Catherine Bedell

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Kenneth R. Mason, Secretary to the Commission

This report was prepared principally by

Harold M. Graves, Jr.

Electrical Machinery and Equipment Branch
Machinery and Equipment Division

Office of Industries
Norris A. Lynch, Director

Address all communications to

Office of the Secretary

United States International Trade Commission

Washington, D.C. 20436

FOREWORD

Each Summary of Trade and Tariff Information is part of a series published by the United States International Trade Commission to provide information on conditions of competition between domestic and foreign products. This report, generally covering the period 1976 through September 1980, is one of many being published in the current series of summaries.

This series provides comprehensive coverage of product uses, the domestic industry, U.S. consumption, production, and trade, and the domestic and international markets in each commodity area. The summaries are cast in terms of the eight schedules of the Tariff Schedules of the United States (TSUS).

The current series will consist of approximately 600 individual reports. The Commission will issue updated statistical tables and industry status reports as appropriate for individual summaries. The overall program will run several years, ultimately covering all items of the TSUS.

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Executive Summary

This summary covers electrical capacitors and resistors. Capacitors and resistors are components used in electrical and electronic circuits, oftentimes in conjunction with other components, to alter the flow of current and to change the characteristic of the voltage. These products are consumed principally in industrialized countries where electrical and electronic products incorporating capacitors and resistors, such as radios, radar, televisions, and computer apparatus, as well as many other electrical and electronic products are manufactured.

Currently, the U.S. rates of duty on imports of capacitors and resistors from countries having most-favored-nation tariff treatment status are 10 percent and 6 percent ad valorem, respectively. Major U.S. trading partners impose duties on these products ranging from free to 17.5 percent ad valorem.

In the United States, the principal producers are located in the east coast and west coast regions. Eight of the approximately 200 producing firms account for over 50 percent of capacitor production, and eight other firms account for over 70 percent of resistor production.

U.S. demand for these products is derived from demand for electrical and electronic products for the consumer, industrial, and military and aerospace markets. During January 1976-September 1980 demand was strong. Apparent U.S. consumption increased from $1.1 billion in 1976 to an estimated $1.9 billion in 1979. In 1980, apparent U.S. consumption was an estimated $2.4 billion. Electrical capacitors accounted for about 60 percent of consumption, and resistors accounted for the remainder. U.S. production followed the same trend as, and represented about 80 percent of, apparent U.S. consumption. U.S.-made products and imported products are similar for the most part.

The value of U.S. imports of capacitors and resistors increased from $220 million in 1976 to $405 million in 1979. Capacitors represented about 60 percent of imports. Japan and Mexico were the principal sources of imports accounting for 29.9 percent and 23.6 percent, respectively, of total U.S. imports of capacitors and resistors. Mexico and other developing countries were the sources of substantial imports entered under item 807.00 of the Tariff Schedules of the United States.

The major producing countries are the United States, Japan, and EC countries. The value of U.S. exports rose from $163 million in 1976 to $308 million in 1979. Capacitors and resistors each accounted for about 50 percent of U.S. exports. The United Kingdom and Mexico were the principal export markets. The value of U.S. exports was less than the value of U.S. imports, and this imbalance grew from 1976 to 1979.

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Description and Uses

Commodity	TSUS item No.
Electrical capacitors, fixed or variable	685.80
If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6)	685.81
Resistors, fixed or variable (including potentiometers, but not including heating elements), and parts thereof	686.10
If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6)	686.11

Note.--For the statutory description, see excerpt from the Tariff Schedules of the United States Annotated (1981) in app. A. A concordance of the TSUS items included in this summary with related categories in other production, export, and import nomenclatures is found in app. B.

Electrical capacitors and resistors are important circuit elements in most electronic circuits and in many electrical circuits. They have a multitude of uses owing to their electrical characteristics. Capacitors block the flow of direct current, but allow the flow of alternating current with a characteristic impedance to the flow and a predictable phase shift in the wave shape. In electronic circuits, some of the uses of capacitors are wave shaping, bypassing, and achieving resonance. In electrical powerline circuits, capacitors are used principally for phase shifting.

Resistors allow the flow of both direct and alternating current with a characteristic impedance to the flow. In electronic circuits, some of the uses of resistors are wave shaping and voltage dropping. In electrical circuits, resistors are used frequently for dissipating energy, for controlling the level of voltage, and for heating purposes. Resistors, other than those of carbon, used for heating purposes are classified in TSUS item 684.50. Carbon resistors for heating purposes are classified in TSUS item 517.91. Neither of these articles is included in this summary.

Capacitors and resistors are made from many different types of materials, in various sizes (both physical and electrical), and by many different techniques. Some capacitors are identified by the type of dielectric used such as air, paper, mica, ceramic, etc. Electrolytic capacitors use an electrolyte to deposit an oxide resulting from current flow on a tantalum or aluminum anode to impede the flow of current. Film capacitors, which use many types of dielectrics, are so named because the dielectric and plates are placed or deposited in the form of a film on a substrate. Resistors frequently consist of a composition material or a length of wire wound around a core. Film resistors consist of a film of resistive material on a substrate placed between two contacts. Both capacitors and resistors may be designed to be fixed or variable in electrical value. Although many types of capacitors and resistors are considered in designing a circuit, once a particular type is chosen, it is not generally interchangeable.

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The technology for production of most capacitors and resistors is widespread in all developed countries and many developing countries. Differences between those produced in the United States and those imported into the United States are generally minor.

Customs Treatment

U.S. customs treatment

The table on page 3 shows the current rates of duty which apply to electrical capacitors and resistors imported from those countries having most-favored-nation status (col. 1) 1/ and the rates of duty which apply to imports from countries designated by the President as being under Communist domination or control (col. 2). 2/ The table also shows that the United States made no concession during the Tokyo round on the rates of duty applicable to electrical capacitors and resistors and that these articles are not eligible articles under the Generalized System of Preferences (GSP). 3/

The customs classification of electrical capacitors and resistors is dependent on the materials used in the articles. The materials used are not readily apparent when the exterior is viewed, and many of these articles have very similar sizes and shapes. Markings showing electrical characteristics on the product speed accurate customs classification. Uncontestable identification, however, requires destroying the article to determine its contents.

Electrical capacitors and resistors are frequently made by multinational firms which use manufacturing operations in more than one country to complete the production of capacitors and resistors. Articles produced in this way are often exported from the United States in a semifinished state and then, after further manufacture (and in some cases, testing) returned to the United States under the provisions of TSUS items 806.30 and 807.00. Applicable rates of duty are applied to the value added abroad, resulting in less duty being paid by the U.S. importer.

1/ The rates of duty in rate of duty column numbered 1 are Most-Favored-Nation (MFN) rates, and are applicable to imported products from all countries except those Communist countries and areas enumerated in general headnote 3(f) of the TSUS. However, such rates would not apply to products of developing countries which are granted preferential tariff treatment under the GSP or under the "LDDC" rate of duty column.

2/ The rates of duty in rate of duty column numbered 2 apply to imported products from those Communist countries and areas enumerated in general headnote 3(f) of the TSUS.

3/ The Generalized System of Preferences, under title V of the Trade Act of 1974, provides duty-free treatment of specified eligible articles imported directly from designated beneficiary developing countries. GSP, implemented by Executive Order No. 11888 of Nov. 24, 1975, applies to merchandise imported on or after Jan. 1, 1976, and is expected to remain in effect until Jan. 4, 1985, unless modified by the President or terminated.

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Electrical capacitors and resistors: U.S. rates of duty, present and negotiated, by TSUS items

TSUS item No.	Description	Present col. 1 rate of duty 1/	Negotiated col. 1 rate of duty 2/	Col. 2 rate of duty 3/	GSP eligibility
685.80	Electrical capacitors, fixed or variable.	10% ad val.	4/	35% ad val.	No.
685.81	If Canadian article and original motor-vehicle equipment.	Free	4/	4/	No.
686.10	Resistors, fixed or variable (including potentiometers but not including heating elements), and parts thereof.	6% ad val.	4/	35% ad val.	No.
686.11	If Canadian article and original motor-vehicle equipment.	Free	4/	4/	No.

1/ Effective Jan. 1, 1981.

2/ Rate negotiated under the Multilateral Trade Negotiations (Tokyo round), to be achieved through 8 annual staged reductions. This rate is currently applicable to products from countries designated as "least developed developing countries." The rates of duty in rate of duty column "LDDC" are preferential rates (reflecting the full U.S. MTN concession rate for a particular item without staging) and are applicable to products of the least developed developing countries designated in general headnote 3(d) of the TSUS which are not granted duty-free treatment under the GSP. If no rate of duty is provided in the "LDDC" column for a particular item, the rate of duty provided in column numbered 1 applies.

3/ Rate provided in the Tariff Act of 1930.

4/ Not applicable.

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During the past 5 years, only tantalum electrolytic fixed capacitors and precision resistor chips of the products included in this summary have been the subject of a statutory investigation. In the capacitor investigation, No. AA1921-159, concluded under the provisions of the Antidumping Act, 1921, as amended, the U.S. International Trade Commission determined, in October 1975, that an industry in the United States was not being, nor likely to be, injured by imports from Japan of tantalum electrolytic fixed capacitors at less than fair value. It was subsequently determined by the U.S. Customs Service that a substantial amount of these capacitors had been misclassified. As a result of orders of the U.S. Customs Court, the Commission, in August 1980, made a new determination with results similar to those in the October 1976 investigation.

In the precision resistor chips investigation, No. 337-TA-63/65, conducted under the unfair competition provisions of section 337 of the Tariff Act of 1930, as amended, a U.S. producer contended that his trade secrets were used to produce precision resistor chips in a foreign country for export to the United States. The case was settled when an agreement was reached between the U.S. producer and the foreign producer with respect to the use of the trade secrets.

Foreign customs treatment

With the exception of the United States and Canada, most countries use the Customs Cooperation Council Nomenclature (CCCN) as the basis for their tariff classifications. Electrical capacitors are classified in heading 85.18 in the CCCN and resistors in heading 85.19. The CCCN does not provide for distinctions between the various types of capacitors and resistors (by physical composition and component materials) such as those that currently exist in the statistical annotations to the TSUS.

The rates of duty for major markets importing finished U.S.-made capacitors and resistors are shown in the table on the following page. The rates for Mexico and other developing nations are not shown since U.S. exports of parts and subassemblies of capacitors and resistors to developing countries are often sent to duty-free foreign trade zones for processing and assembly and return to the United States.

U.S. Industry

Basic data and information

The industry producing electrical capacitors and resistors consists of over 200 firms, many of which have multinational manufacturing operations. Approximately 130 firms, collectively employing some 34,000 workers, manufacture electrical capacitors, and about 105 firms, collectively employing approximately 22,000 workers, produce electrical resistors. Eight firms account for more than 50 percent of the value of U.S. shipments of capacitors, and eight others account for over 70 percent of the value of U.S. shipments of resistors. Only a few firms make both capacitors and resistors.

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Capacitors and resistors: Selected rates of duty in principal foreign markets, present and negotiated

Market	Description of commodity and foreign tariff item No.	Present rate of duty 1/	Negotiated rate of duty 2/
Canada	Capacitors (condensors), electronic, and parts, 44059-1.	Free	Free
	44508-1	17.5% ad val.	10.2% ad val.
	44524-1	15.7% ad val.	10.2% ad val.
	44533-1	13.6% ad val.	9.2% ad val.
	Resistors, electronic, and parts, 44059-1.	Free	Free
	44508-1	17.5% ad val.	10.2% ad val.
	44524-1	15.7% ad val.	10.2% ad val.
	44533-1	13.6% ad val.	9.2% ad val.
EC	Electrical capacitors (85.18).		
	Electrolytic fixed capacitors.	7% ad val.	7% ad val.
	Variable and preset capacitors.	7% ad val.	7% ad val.
	Other	6.5% ad val.	4.9% ad val.
	Resistors, fixed or variable (including potentiometers) other than heating resistors (85.19B).	7.3% ad val.	5.3% ad val.
Japan	Electrical capacitors, fixed or variable (85.18).	5.6% ad val.	4.2% ad val.
	Other (85.19 2)	5.4% ad val.	3.6% ad val.

1/ Rates currently applicable to imports from the United States.
2/ Final rates negotiated under the Multilateral Trade Negotiations.

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Although employment has fluctuated, it appears to be increasing. The manufacturing establishments are spread throughout the United States, but are located principally in New Jersey, Pennsylvania, and California. An increasing number of establishments are being located in the Southeastern and Southwestern States where, manufacturers claim, wages are lower and incentives are provided by some States.

Value added in U.S. establishments increased from $562 million in 1972 to $874 million in 1977. Value added per employee increased from $11,700 to $17,700 during the same period. Because these data are unadjusted for inflation, productivity has not increased as rapidly as they would suggest. However, the industry has become increasingly capital intensive in the United States and accomplishes some of the low-skilled manual labor outside the United States in developing countries.

The product mix of the industry is constantly changing to accommodate the requirements of rapidly developing technology in the computer, data-processing, and telecommunications industries. However, most of the older designs are still used in large quantities and are being phased out, but slowly. Competitive conditions in the industry necessitate rigid cost controls to offset the rapid increase in the cost of materials used in making its products. The competitive nature of the industry, compounded by escalating costs of materials and the changing demands of manufacturers using resistors and capacitors, require producers to remain flexible and to maintain technological skills at a high level.

Financial information

Financial data are not publicly available because most of the major producers are subsidiaries of larger firms (most of which are conglomerates not vertically integrated); one is privately held. It is estimated that in 1979 an average company would show income before taxes at approximately seven percent of sales and net income at about four percent of sales. The average firm had a sales to inventory ratio of about three to one in 1979 and maintained a current ratio of about two to one. These levels vary over a wide range for individual firms.

The financial well-being of the firms is tied to their technological and cost-cutting competence and to the demand for end products in which the articles are used. It is estimated that the industry, like many electronic industries, invests about 5 percent of the value of sales in new plants and equipment and approximately 3 percent in research amd development.

Although many producers, formerly independent, are now subsidiaries of larger firms, there have been few exits from the industry in the past 5 years. Formerly, independent producers experienced great difficulty in making necessary investments and maintaining cash flow during recessionary periods. It is estimated that profit levels, in the long term, fluctuate over a wide range, with a median of about 5 percent, but are generally lower than those of manufacturers of finished electronic products and somewhat below the average for the entire electrical and electronics sector.

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Price setting

Manufacturers and distributors of electrical capacitors and resistors publish price lists for standard products showing quantity discounts and financial terms. The price lists are changed or modified as necessary to adjust to the manufacturers' and distributors' financial conditions and to the market.

Most manufacturers use both wholesale and retail distributors for some of their standard products. For sales to original equipment manufacturers, producers also use an internal sales force or a manufacturer's representative for some or all of their products.

Prices and pricing trends are often set by competition in the market. Most sales are consummated after a selection process in which several manufacturers' products are considered. Often, more than one manufacturer is selected to provide very similar products to a purchaser. In this type of competitive environment, custom-made variations of standard products are often developed and provided in response to a purchaser's specific requirements. The bulk of the sales, however, are of standard products, and the price is based on a price list.

The U.S. Market

Domestic market profile

The domestic market is made up of thousands of producers of electrical and electronic products using electrical capacitors and resistors. The market is spread throughout the United States, with heaviest concentrations on the east and west coasts. The market is roughly divided into manufacturers of industrial, military, and consumer products, the industrial group being the largest. The principal market determinants are specifications, reliability, availability, and price, but not necessarily in that order for all sales in all markets. In most instances, several domestic manufacturers and several importers are capable of supplying the product demanded by the market; most products are substitutable. Except in certain cases where a highly dependable source of supply is paramount, all producers and importers have equal access to the market.

U.S. consumption

The value of apparent U.S. consumption of electrical capacitors and resistors increased from $1.2 billion in 1976 to an estimated $1.9 billon in 1979, or by 64 percent (table 1, app. C). A further increase to about $2.4 billion for 1980 is indicated by data for January-September which show the value of consumption for 1980 to be about 24 percent higher than during the corresponding period of 1979. The increase is attributed to the rapid growth in the market for electronic products in which capacitors and resistors are used, but the increase also reflects the increased costs of materials, labor, and capital equipment used in making capacitors and resistors. The value of U.S. imports of capacitors and resistors accounted for about 20 percent of apparent U.S. consumption and increased at about the rate of U.S.

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consumption. U.S. shipments and exports followed a similar trend as U.S. imports.

Electrical capacitors accounted for about 60 percent of total consumption in 1976 and increased from $676 million in that year to an estimated $1.2 billion in 1979, or by 72 percent (table 2). Consumption of capacitors was about 30 percent higher during January-September 1980 than during the corresponding period of 1979.

Although consumption of resistors also increased throughout the period January 1976-September 1980, the increase was not as rapid as for capacitors. The value of apparent consumption of resistors rose from $498 million in 1976 to an estimated $756 million in 1979, or by 52 percent (table 3).

U.S. shipments

The value of U.S. producers' shipments increased from $1.1 billion in 1976 to an estimated $1.8 billion in 1979, or by 63 percent. During January-September 1980, shipments were about $1.7 billion, or 25 percent higher than shipments during the corresponding period of 1979. Capacitors accounted for about 57 percent of the value of shipments in 1976, increasing from $632 million in that year to about $1.1 billion in 1979, or by 74 percent. In 1979, capacitors accounted for about 60 percent of shipments. In 1979, ceramic capacitors, the largest selling type of capacitor, accounted for about one-third of the value of U.S. producers' shipments; tantalum electrolytic capacitors accounted for about one-fourth; and paper and film types about one-fifth. Only tantalum electrolytic and ceramic capacitors commanded more of the market in 1979 than in 1976.

The value of U.S. producers' shipments of resistors increased from $485 million in 1976 to an estimated $725 million in 1979, or by about 50 percent. The major markets were for variable non-wirewound and metal film resistors. Fixed film resistors, both carbon and metal, and resistor networks accounted for a greater share of the total in 1979 than in 1976. Fixed carbon composition and variable resistors both accounted for a smaller market share in 1979 than in 1976.

U.S. imports

The value of total U.S. imports in 1979 consisted chiefly of capacitors, of which fixed capacitors were the principal type imported. Types of imported fixed capacitors included ceramic, aluminum electrolytic, and tantalum electrolytic capacitors; some film, paper, and mica capacitors were also imported. Variable capacitors constituted only about 3 percent, by value, of U.S. imports of capacitors in 1979.

Of the resistors imported, fixed resistors accounted for slightly over half of the total value. Film, both carbon and metal, resistors and carbon composition resistors were the principal types of fixed resistors imported. Variable non-wirewound resistors were the principal type of variable resistors imported. Wirewound resistors, both fixed and variable, accounted for a small share of the value of resistor imports.

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The value of U.S. imports of capacitors and resistors increased from $220 million in 1976 to $405 million in 1979, or by 84 percent (table 4). Japan was the source of 29.9 percent of the value of total imports in 1979 and Mexico accounted for 28.6 percent. Imports during January-September 1980 amounted to $332 million, or 12 percent higher than imports during the corresponding period of 1979. Imported capacitors and resistors are used in virtually all segments of the electrical and electronics market. Nearly 40 percent of the value of imports was entered under TSUS items 806.30 and 807.00 in 1979. 1/ The following table shows the combined value of 806.30 and 807.00 imports in 1979. The 806.30 component was small. The Dominican Republic, Barbados, Haiti, and Israel accounted for over 70 percent of the imports included in the "all other" category in the table.

Electrical capacitors and resistors: U.S. imports under TSUS items 806.30 and 807.00, by principal sources, 1979

(In thousands of dollars)

Source	U.S. imports under items 806.30 and 807.00 of--		Total imports under items 806.30 and 807.00
	Capacitors	Resistors	
Japan	26	-	26
Mexico	70,095	31,103	101,198
El Salvador	15,076	12,012	27,088
Taiwan	10,543	3	10,546
Federal Republic of Germany	-	-	-
Canada	26	243	269
Republic of Korea	81	1	82
United Kingdom	1,031	79	1,110
All other	8,571	11,203	19,774
Total	105,449	54,644	160,093

Capacitor imports, which represented 61 percent of combined total imports of capacitors and resistors in 1979, increased in value from $142 million in 1976 to $248 million in 1979, or by 75 percent (table 5). Japan and Mexico were the chief sources of capacitors in 1979, accounting for 32 percent and 30 percent, respectively, of the total. A large share of the imports from Mexico

1/ Under the provisions of TSUS item 806.30, articles of metal (except precious metal) that have been manufactured, or subjected to a process of manufacture, in the United States, and exported for processing and returned to the United States for further processing, are subject to duty only on the value of the foreign processing. Under TSUS item 807.00, imported articles assembled in foreign countries with fabricated components that have been manufactured in the United States are subject to duty upon the full value of the imported product less the value of the U.S. fabricated components contained therein. No further processing is required for articles entered under TSUS item 807.00.

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(about 95 percent) as well as from Taiwan, El Salvador, and the Dominican Republic, which accounted for four of the eight major import sources was entered under TSUS item 807.00. About 46 percent of the value of capacitor imports under TSUS item 807.00 was declared to be U.S. goods returned. Only a very small amount of the value of capacitor imports was entered under TSUS item 806.30.

The value of U.S. imports of resistors more than doubled from $78 million in 1976 to $157 million in 1979 (table 6). Mexico and Japan, each accounting for about 27 percent of total U.S. imports in 1979, were the chief sources of imports. About 57 percent of the value of resistor imports was entered under TSUS item 807.00. Of total resistor imports from Mexico, the value entered under TSUS item 807.00 accounted for 74 percent. Imports under TSUS item 807.00 from El Salvador, Barbados, Haiti, and Israel were also substantial. Roughly half of the value of resistor imports entered under TSUS item 807.00 was declared to be U.S. goods returned. Imports of resistors under TSUS item 806.30 were negligible.

Importers of capacitors and resistors include U.S. producers of these products, U.S. producers of end products which incorporate capacitors and resistors, U.S. subsidiaries of foreign producers, and general importers. Imports of capacitors and resistors from developing countries are principally by U.S. producers of such products.

The International Market

International market profile

The major free-world markets for finisned capacitors and resistors are the United States, European Community (EC) countries, and Japan. These countries also manufacture the bulk of the end products in which capacitors and resistors are incorporated. Developing countries such as Taiwan, Mexico, the Republic of Korea, and Brazil also represent sizable markets for capacitors and resistors used in the assembly of end products. Developing countries are also a major market for parts of capacitors and resistors. Parts of capacitors and resistors are sent to these countries for processing or assembly into finished or semifinished capacitors and resistors. A large share of the finished or semifinished products are returned to the country which was the origin of the parts in order to complete a multinational manufacturing operation. Developed nonmarket economy countries where electrical and electronic products are made are also markets largely untapped by U.S. exporters of capacitors and resistors.

The bulk of capacitors and resistors consumed in the world market are not articles of international trade. U.S. producers of capacitors and resistors supply about 80 percent of the U.S. market; similarly, Japanese producers and EC producers supply a large share of their respective markets. The United States and Japan together account for over 75 percent of the trade in supplying free-world markets, including those in developing countries.

The principal factors affecting U.S. export demand and competitiveness in world markets are technology, ease of entry, and corporate relationships. The

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United States possesses most of the technology used in the production of capacitors and resistors and is the largest market for these products. However, most developed countries also possess this technological capability. In most developed countries, U.S. exporters are competing against domestic producers, many of which are integrated and captively consume these articles in end products. The capability of U.S. firms to penetrate these markets is strongly tested. However, U.S. producers do serve U.S.-based multinational firms both in their U.S. establishments and foreign establishments. In the case of developing countries, most of the U.S. exporting firms supply parts to their foreign subsidiaries for processing or assembly into finished or semifinished capacitors and resistors. Although much of the semifinished goods are returned to the United States, a significant amount of the finished goods is consumed in the developing countries or exported to developed countries.

U.S. exports

U.S. exports of capacitors and resistors in 1979 consisted chiefly of capacitors (about 59 percent, by value). Fixed capacitors were the principal type of capacitor exported, accounting for 81 percent of total capacitor exports. Ceramic capacitors and tantalum electrolytic capacitors were the major types of fixed capacitors exported. Fixed resistors accounted for about 56 percent of the total value of U.S. exports of resistors in 1979. Parts of resistors (included in fixed resistors) were the major product followed by film, both carbon and metal, and carbon composition resistors. Of the variable resistors exported, nonwirewound was the principal category.

During 1976-79, the value of U.S. exports of capacitors and resistors grew by 89 percent, rising from $163 million in 1976--26 percent of shipments--to $308 million in 1979--17 percent of shipments (table 7). Exports during January-September 1980 totaled $286 million, 28 percent higher than exports during the corresponding period of 1979. Exports of capacitors rose from $98 million in 1976 to $182 million in 1979, or by 86 percent (table 8). The major markets were Canada, the United Kingdom, West Germany, and Mexico. Both Canada and Mexico received U.S. exports of parts of capacitors and resistors and returned a sizable amount of the value of these exports to the United States under the provisions of TSUS item 807.00. France, Italy, and Switzerland are among the eight largest markets, indicating the importance of European markets to U.S. exporters.

The value of U.S. exports of resistors rose from $65 million in 1976 to $126 million in 1979, or by 93 percent (table 9). The principal markets were Mexico, the United Kingdom, and West Germany. Most exports to Mexico and El Salvador, the only developing countries included in the eight principal markets, were resistor parts which were subsequently returned to the United States in an advanced stage of manufacture. Like the U.S. market for capacitors, Canada, European countries, and developing countries are the principal markets for resistors, although Japan was among the eight largest export markets for domestic resistors in 1979.

The United States has a negative trade balance for capacitors and resistors. In 1976, imports exceeded exports by $56 million and by $97 million in 1979.

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Appendix A

Part 5, Schedule 6, of the Tariff Schedules of the United States Annotated (1981)

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GSP	Item	Stat. Suffix	Articles	Units of Quantity	Rates of Duty 1	Rates of Duty LDDC	Rates of Duty 2
	685.80		Electrical capacitors, fixed or variable	. .....	10% ad val.		35% ad val.
			Fixed capacitors:				
		05	Aluminum electrolytic	No.			
		10	Tantalum electrolytic	No.			
			Ceramic:				
		14	Single layer (disc or tubular)	No.			
		18	Multilayer, leaded or chip, (monolithic)	No.			
			Paper or film:				
			2 microfarads and over:				
			Metalized film:				
		19	Oil filled	No.			
		21	Other	No.			
			Metalized paper:				
		22	Oil filled	No.			
		23	Other	No.			
		26	Other	No.			
		28	Less than 2 microfarads	No.			
		30	Mica	No.			
		35	Other fixed capacitors	No.			
		40	Variable capacitors	No.			
	685.81	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6)	X.....	Free		
A*	685.90		Electrical switches, relays, fuses, lightning arresters, plugs, receptacles, lamp sockets, terminals, terminal strips, junction boxes and other electrical apparatus for making or breaking electrical circuits, for the protection of electrical circuits, or for making connections to or in electrical circuits; switchboards (except telephone switchboards) and control panels; all the foregoing and parts thereof	.....	7.7% ad val.	5.3% ad val.	35% ad val.
			Electrical switches and relays:				
			Containing an automatic overload or tripping mechanism (circuit breakers):				
		02	Molded case	No.			
			Other:				
		04	In circuits of less than 1,000 V	No.			
		06	In circuits of 1,000 V or more, but less than 345 KV	No.			
		08	In circuits of 345 KV or higher	No.			
			Other:				
		22	Rotary	No.			
		24	Push-button	No.			
		26	Snap-action	No.			
			Knife:				
		28	In circuits of not over 1,000 V	No.			
		32	In circuits of over 1,000 V	No.			
			Relays:				
		34	With contacts rated at less than 10 A	No.			
		36	With contacts rated at 10 A and over	No.			
		38	Other	No.			

Note: For explanation of the symbol "A" or "A*" in the column entitled "GSP", see general headnote 3(c).

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GSP	Item	Stat. Suffix	Articles	Units of Quantity	Rates of Duty 1	Rates of Duty LDDC	Rates of Duty 2
A*	685.90 (con.)		Electrical switches, relays, fuses, etc. (con.):				
			Fuses:				
			In circuits of less than 2,300 V:				
		39	Glass cartridge	No.			
		42	Other	No.			
		44	In circuits of 2,300 V or more	No.			
		45	Junction boxes	No.			
			Connectors:				
		48	Coaxial	No.			
			Cylindrical, multicontact:				
		49	Rated at 120 V or more and 20 A or more, including pin and sleeve	No.			
		51	Other	No.			
		52	Rack and panel	No.			
		53	Printed circuit	No.			
		54	Other	No.			
		55	Printed circuit boards	No.			
		57	Lampholders	No.			
		61	Switchgear assemblies and switchboards in circuits of not over 1,000 V	No.			
		63	Switchgear assemblies and switchboards in circuits of over 1,000 V	No.			
		66	Panel boards and distribution boards in circuits of not over 1,000 V	No.			
		68	Terminals, electrical splices and electrical couplings	X			
			AC motor starters and contactors:				
		70	Rated not over 600 V	No.			
		72	Rated over 600 V	No.			
		74	AC motor control centers	No.			
		80	Other, including parts of the foregoing	X			
	685.91	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6)	X	Free		
	686.10		Resistors, fixed or variable (including potentiometers, but not including heating elements), and parts thereof		6% ad val.		35% ad val.
			Variable resistors (including potentiometers):				
		30	Wirewound	No.			
		35	Other	No.			
			Fixed resistors:				
		47	Carbon composition	No.			
			Film:				
		51	Carbon	No.			
		52	Other	No.			
		53	Wirewound	No.			
		57	Other	No.			
		60	Parts of the foregoing	X			
	686.11	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6)	X	Free		

Note: For explanation of the symbol "A" or "A*" in the column entitled "GSP", see general headnote 3(c).

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Appendix B

Concordance of TSUS Numbers, Schedule B Numbers, SIC Numbers
SITC Numbers, and CCCN Numbers

Electrical capacitors and resistors: TSUS item numbers, Schedule B numbers, SIC numbers, SITC numbers, and CCCN numbers included in this commodity group

TSUS item No.	Schedule B No.	SIC No.	SITC No.	CCCN No.
685.80	685.80 (pt.)	3675 (pt.)	729.95 (pt.)	85.18 (pt.)
685.81	685.80 (pt.)	3675 (pt.)	729.95 (pt.)	85.18 (pt.)
686.10	686.10 (pt.)	3676 (pt.)	722.20 (pt.)	85.19 (pt.)
686.11	686.10 (pt.)	3676 (pt.)	722.20 (pt.)	85.19 (pt.)

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Appendix C

Statistical Tables

Table 1.-- Electrical capacitors and resistors: U.S. shipments, exports of domestic merchandise, imports for consumption, and apparent consumption, 1976-79, January-September 1979, and January-September 1980

Period	Shipments	Exports	Imports	Apparent consumption	Ratio of imports to consumption
	Million dollars				Percent
1976	1,117	163	220	1,174	18.7
1977	1,327	190	276	1,413	19.5
1978	1,491	236	321	1,576	20.4
1979	1/ 1,825	308	405	1/ 1,922	1/ 21.1
January-September--					
1979	1/ 1,300	223	296	1/ 1,372	1/ 21.5
1980	1/ 1,660	286	332	1/ 1,707	1/ 19.5

1/ Estimated by the staff of the U.S. International Trade Commission.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Table 2.--Electrical capacitors: U.S. shipments, exports of domestic merchandise, imports for consumption, and apparent consumption, 1976-79, January-September 1979, and January-September 1980

Period	Shipments	Exports	Imports	Apparent consumption	Ratio of imports to consumption
	Million dollars				Percent
1976	632	98	142	676	21.0
1977	745	119	169	795	21.3
1978	866	134	193	925	20.1
1979	1/ 1,100	182	248	1/ 1,166	21.3
January-September--					
1979	1/ 760	130	181	1/ 811	22.4
1980	1/ 1,040	178	206	1/ 1,068	19.3

1/ Estimated by the staff of the U.S. International Trade Commission.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Table 3.--Electrical resistors: U.S. shipments, exports of domestic merchandise, imports for consumption, and apparent consumption, 1976-79, January-September 1979, and January-September 1980

Period	Shipments	Exports	Imports	Apparent consumption	Ratio of imports to consumption
	Million dollars				Percent
1976	485	65	78	498	15.6
1977	583	72	107	617	17.3
1978	626	103	128	651	19.7
1979	1/ 725	126	157	1/ 756	20.8
January-September--					
1979	1/ 540	93	114	1/ 561	20.3
1980	1/ 620	108	127	1/ 639	19.8

1/ Estimated by the staff of the U.S. International Trade Commission.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

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Table 4.--Electrical capacitors and resistors: U.S. imports for consumption, by principal sources, 1976-79 and January-September 1979, and January-September 1980

(In thousands of dollars)

Source	1976	1977	1978	1979	January-September-- 1979	January-September-- 1980
Japan	62,461	85,919	102,666	121,161	89,876	103,285
Mexico	74,208	83,824	99,485	115,740	84,198	93,497
Salvadr	37	1,310	8,892	27,207	19,382	18,021
Taiwan	11,246	13,912	15,259	22,930	16,803	19,186
FR Germ	14,778	15,175	13,951	19,340	14,423	17,628
Canada	8,343	9,448	12,348	11,475	8,242	11,806
Kor Rep	4,316	7,136	10,744	11,146	8,755	4,899
U King	3,004	3,515	5,062	9,644	6,667	7,521
All other	41,355	55,546	52,878	66,274	47,174	56,533
Total	219,749	275,785	321,285	404,915	295,521	332,376

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 5.--Electrical capacitors: U.S. imports for consumption, by principal sources, 1976-79 and January-September 1979, and January-September 1980

(In thousands of dollars)

Source	1976	1977	1978	1979	January-September-- 1979	January-September-- 1980
Japan	41,175	54,555	65,111	79,260	58,961	66,147
Mexico	49,378	52,033	61,679	73,824	54,137	59,959
Taiwan	9,965	12,048	12,578	18,577	13,712	14,514
FR Germ	12,840	12,651	10,938	15,571	11,621	14,256
Salvadr	-	179	4,501	15,123	10,461	13,355
Kor Rep	3,889	4,995	7,047	6,662	5,169	3,151
Dom Rep	2,912	4,269	5,258	6,512	4,303	3,484
U King	1,334	1,815	2,328	3,946	2,672	4,081
All other	20,398	26,706	23,885	28,341	20,406	26,869
Total	141,892	169,250	193,325	247,816	181,442	205,815

1/ Less than 500.

Source: Compiled from official statistics of the U.S. Department of Commerce.

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Table 6.--Electrical resistors: U.S. imports for consumption, by principal sources, 1976-79 and January-September 1979, and January-September 1980

(In thousands of dollars)

Source	1976	1977	1978	1979	January-September-- 1979	January-September-- 1980
Mexico	24,830	31,791	37,806	41,917	30,060	33,538
Japan	21,286	31,364	37,555	41,900	30,916	37,138
Salvadr	37	1,131	4,391	12,083	8,921	4,667
Canada	5,205	6,687	9,631	7,910	6,008	6,337
U King	1,670	1,700	2,734	5,698	3,996	3,440
Israel	1,626	3,018	3,348	4,704	3,233	4,754
Barbado	99	1,837	3,104	4,589	3,204	3,701
Brazil	4,640	5,188	3,741	4,564	3,252	3,996
All other	18,464	23,819	25,652	33,735	24,489	28,990
Total	77,857	106,534	127,961	157,099	114,079	126,561

Source: Compiled from official statistics of the U.S. Department of Commerce.

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Table 7.--Electrical capacitors and resistors: U.S. exports of domestic merchandise, by principal markets, 1976-79 and January-September 1979, and January-September 1980

(In thousands of dollars)

Market	1976	1977	1978	1979	January-September-- 1979	1980
U King.....	16,965	20,817	27,824	40,962	30,208	41,055
Mexico.....	34,911	35,996	37,887	39,520	29,086	40,625
Canada.....	19,728	19,934	24,565	36,957	26,336	30,344
FR Germ.....	15,752	19,551	27,881	36,454	26,062	35,783
Salvadr.....	126	692	7,755	18,824	13,275	12,060
France.....	12,327	13,300	18,106	17,530	13,579	16,152
Switzld.....	7,194	8,053	11,967	14,991	11,440	15,473
Italy.....	6,903	7,881	9,798	12,663	9,104	14,913
All other...	49,149	63,873	70,321	90,061	63,959	79,256
Total...	163,056	190,096	236,105	307,962	223,048	285,660

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 8.--Electrical capacitors: U.S. exports of domestic merchandise, by principal markets, 1976-79 and January-September 1979, and January-September 1980

(In thousands of dollars)

Market	1976	1977	1978	1979	January-September-- 1979	1980
Canada.....	12,599	13,991	18,315	26,363	18,867	22,923
U King.....	8,284	12,285	15,212	24,026	17,541	25,345
FR Germ.....	8,366	10,842	15,600	19,979	13,264	21,969
Mexico.....	20,128	22,061	13,904	19,004	14,490	18,369
France.....	8,304	9,332	11,603	11,246	8,421	11,760
Italy.....	4,570	5,485	6,853	9,139	6,389	11,301
Salvadr.....	24	19	3,197	8,430	5,600	11,626
Switzld.....	3,573	3,741	6,108	6,354	4,775	7,541
All other...	32,134	40,769	42,779	57,743	40,745	47,287
Total...	97,982	118,526	133,569	182,284	130,092	178,120

Source: Compiled from official statistics of the U.S. Department of Commerce.

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Table 9.--Electrical resistors: U.S. exports of domestic merchandise, by principal markets, 1976-79 and January-September 1979, and January-September 1980

(In thousands of dollars)

Market	1976	1977	1978	1979	January-September-- 1979	January-September-- 1980
Mexico	14,783	13,935	23,983	20,516	14,596	22,256
U King	8,681	8,532	12,612	16,937	12,667	15,710
FR Germ	7,386	8,709	12,282	16,475	12,798	13,814
Canada	7,129	5,943	6,250	10,594	7,468	7,421
Salvadr	102	673	4,557	10,394	7,675	434
Switzld	3,620	4,311	5,859	8,637	6,666	7,932
France	4,023	3,968	6,503	6,284	5,158	4,392
Japan	2,672	3,271	3,806	5,888	4,276	4,455
All other	16,676	22,229	26,682	29,954	21,653	31,125
Total	65,074	71,570	102,536	125,679	92,957	107,540

Source: Compiled from official statistics of the U.S. Department of Commerce.

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